TITLE

Engine Improvements

TECHNICAL FIELD

The present invention relates to improvements to engines, and particularly internal combustion engines.

BACKGROUND ART

The most commonly known type of internal combustion engine is the reciprocating piston engine, where the linear reciprocating movement of the pistons is driven by fuel ignition and combustion.

The linear motion of the pistons is converted into a rotary motion by the crankshaft. Typically the crankshaft is positioned external to the engine block and provides a portion to connect the engine to devices such as to the drive of a vehicle or an electrical generator.

In virtually all conventional engines the block and head are fixed, and form an immoveable part of the engine; they are thereby limited to the amount of usable work that they can contribute, and so it is that all work and power outputs are delivered solely via the crankshaft. What's more, any substantial rotational momentum must be provided by a flywheel attached to the crankshaft.

Conventional engines then have relatively large and heavy crankshafts and engine blocks (especially if the engine has multiple pistons and cylinders). The need for such large and heavy parts is in part as a result of the high forces transferred by the piston to the crankshaft (and engine block via bearings) at initial ignition, as the journal to which the piston connects on the crankshaft is in line, or close thereto to the line of travel (and force) of the piston and connecting rod at the time of ignition.

Conventional engines have a head component (or part), that is complex and troublesome because the inside of the head at each cylinder region forms one of two main sides to the combustion chamber and is joined there by a head gasket and bolts, and it is against this head that combustion pressure exerts itself to cause the piston to move.

Patent number GB488336 discloses a rotary engine that is composed of

exposed single cylinder engines or cylinders that rotate but do so driven by the crankshaft primarily. It does not claim an invention having a cylinder positioned to obtain the best leverage and the prime mover to give rotation. Therefore this engine would have a similar per cylinder performance as a conventional engine.

It is an object of the present invention to provide an engine that overcomes or at least substantially ameliorates the problems associated with the engines of the prior art.

Other objects and advantages of the present invention will become apparent from the following description, taken in connection with the accompanying drawings, wherein, by way of illustration and example, an embodiment of the present invention is disclosed.

DISCLOSURE OF THE INVENTION

In one form of this invention this there is proposed an engine having a fixed portion and at least one separate cylinder block that defines and in cooperation with a piston fully encloses at least one chamber in which the piston can reciprocate, wherein the cylinder block rotates relative to the fixed portion to provide a work output.

Preferably the fixed portion is a casing.

Preferably the cylinder block is a rotor with an output shaft attached to it.

Preferably the fixed portion retains that rotor such that the rotor is free to rotate about an axis of rotation passing through its centre.

Preferably the centre of the output shaft is collinear with the axis of rotation of the cylinder block.

Preferably inlet charges and exhaust products are supplied and removed respectively from the combustion chamber via the output shaft.

Preferably, with respect to the direction of rotation of the block, the combustion chamber is substantially positioned on a trailing side of the centre of rotation of the block.

Preferably the engine is a combustion engine, the chamber a combustion chamber, and wherein the piston is oriented within the cylinder block so as to be tangentially oriented around the axis of rotation, with the head of the piston pointed in the direction of rotation.

Preferably the piston has attached to it driving means that convert its reciprocating motion into a circular motion that assists in rotating the cylinder block relative to the fixed portion.

Preferably the driving means for each piston include a connecting rod, a crankshaft, and at least one pinion gear connected to the crankshaft such that the pinion gear engages at least one ring type gear fixed to the fixed portion.

Preferably the crankshaft and pinion gear share a common axis of rotation.

Preferably the piston is oriented in a plane normal to the centre of rotation of the block.

Preferably the piston is oriented with its head pointed in the direction that the cylinder block will rotate.

Preferably the piston is offset form the centre of rotation of the block.

In a further form, the invention may be said to lie in a method of effecting a cycle of an engine including a fixed portion and at least one separate cylinder block that defines at least one chamber fully enclosed by the cylinder block, in which a piston can reciprocate, wherein the cylinder block rotates relative to the fixed portion to provide a work output, wherein as a working fluid in the chamber expands and drives the cylinder and the block in opposing directions, this in turn rotates a pinion gear that is connected to a crankshaft, the pinion gear engages a ring type gear fixed to a fixed portion, such that the rotation of the pinion gear on the ring type gear rotates the cylinder block relative to the fixed portion thereby providing a work output, whilst simultaneously driving the piston back into a position where it can accept a fresh charge.

Preferably the fresh charge comprises fresh working fluid.

Preferably the fresh charge comprises working fluid and fuel.

Preferably the working fluid is air.

Preferably the working fluid is steam.

Preferably the engine is an internal combustion engine.

Preferably the cylinder is spaced apart from the centre drive shaft in the centre of the engine, and end plates connect first and second sides to said shaft.

Preferably the engine has provided ignition and fuel and air for the combustion process means added effective in the cylinder and that may be of any current type and suitable to "fire" and drive the piston and the invention is able to use fuel of any type.

Preferably said piston is adapted to be attached to said rotor in a manner that enables the piston to move in effect back and forth in the rotor even while the rotor is spinning. The movement is provided so that the piston can create a stroke and assist to create a combustion chamber and cycle.

Preferably the piston obtains said movement on the rotor by being attached to the rotor on said arm or (a connecting arm or rod or plate mechanism).

Preferably the piston is elongated in shape and is of adequate or extra length than otherwise would be needed so that the aperture for the con-rod ??? in the rotor is covered by the elongated piston. The piston having at least one sealing or piston ring or set thereof at one end, preferably the front piston end is the preferred combustion chamber end.

Preferably the planetary gear is fixed to the cylinder block or rotor in a precise position by a shaft, and is supported on the shaft on bearings about which the gear can rotate, the gear meshed with the ring gear which is stationary, thereby when the engine is turned or turns the planetary gear moves rotationally with the rotor and revolves by its connection to the outside gear, thereby causing the con-rod ??? to move back and forward and consequently to move the piston backwards and forward.

Preferably, when the rotor is caused to rotate (by a starter motor) the planetary gear is caused to rotate and by being connected via its teeth to the ring gear, the

planetary gear moves the attached crank shaft, con-rod ??? and piston back and forth.

Preferably the con-rod and piston move rotationally with the rotor while remaining free to reciprocate independently of the rotor.

Preferably the cylinder block has a second piston similar to the first, located inside of it and that piston runs in the same rotor or cylinder block as the first piston.

The said second piston is located on one side of the first piston and in one aspect acts to provide a second side to the combustion chamber and in a second aspect is provided to be the mechanism that turns the rotor by the pressure from fuel burning and drives the engine.

Preferably the second piston connection to the rotor and to the outside of the engine mechanism is arranged so that when fuel is ignited in the combustion chamber or space between said pistons the pressure in the backwards direction from such combustion does not significantly if at all effect the forward travel of the second piston and the rotor, because the crank shaft type connection via a gear and the gear turns freely on a bearing on the rotor and moves in the right manner so that this does not occur, as aforesaid above, assisted by the second piston being moveable independently, thereby allowing greater freedom and distance of adjustment to obtain combustion when the pistons come together, and without loss through kick-back travel or pressure, the second piston independent travel adjusted with relation to the first piston's independent travel to obtain the best movement and effect in this respect.

Preferably the invention provides that the first piston is caused to decelerate in its speed at the time of initial and continuing combustion stroke, with respect to the acceleration or speed of the second piston and of the rotor's rotation and is able to do so by its said connection via a crank shaft or lever to the revolving planetary gear location on the side of centre of the gear that causes the lever to move in the opposite direction to the rotor (by gear use), and can apply a force to turn the rotor via its connection to the stationary ring or star gear outside.

Preferably a suitable flywheel and or counter balance mechanism is added to the engine. Alternatively the rotor itself will act as a flywheel.

In a further embodiment the gears may be replaced with tooth belts and pulleys.

Preferably the engine has a firing cycle that is sequential.

Preferably the engine uses either a two stroke or four stroke cycle.

Preferably plate like end covers are provided over the outside ends to the cylinder shaft and gears, and provide the support for bearings and seals for the drive shaft.

Preferably, conventional fuel ignition, air supply and exhaust removal means are utilised to produce a functional internal combustion engine.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of this invention it will now be described with respect to the preferred embodiment which shall be described herein with the assistance of drawings wherein;

Figure 1 is an exploded view of the engine showing hidden detail;

Figure 2 is a sectional view through the block and casing at A-A.

BEST MODE FOR CARRYING OUT THE INVENTION

Now referring to the illustrations, and in particular to Figure 1, there is a fuel burning internal combustion engine 1 having a fixed portion in the form of casing 2 and a separate cylinder block 3. The block 3 is a rotor that is retained by the casing 2 such that the rotor is free to rotate about an axis of rotation 14 passing through its centre.

It is to be understood by a person skilled in the relevant art that an external casing is not a rigid requirement to make the invention work, all that is needed is an external structure to which a ring gear can be attached, such as a plate, block or the like.

The block 3 defines and in cooperation with pistons 5 fully enclose combustion chambers 22 for the four cylinders 4; each cylinder including pistons 5, connecting rods 6, and crankshafts 7. The combustion chambers 22, are positioned adjacent to and on a trailing side to the direction of block

rotation direction, on a radial line 23 extending outwardly from the engine's centre axis 14.

Gudgeon pins 9 and 10 connect the pistons 5 to crankshafts 7, which in turn have pinion gears 11 attached to them, such that the crank shafts 7 and pinion gears 11 share a common axis of rotation.

Block 3 is adapted to move rotationally around axis 14, with rotation in the same direction as that of the hollow output and centre shaft 13.

Each of the pistons 5 is oriented within the cylinder block so as to be tangentially oriented around the axis of rotation, with the head of each piston pointed in the direction of rotation.

There are some engines of the prior art that have an outer casing which is fixed and retains a rotor that rotates within the casing. In these engines however, the combustion chambers in which the pistons reciprocate are defined by the piston, rotor and the casing together, so that without the casing, each combustion chamber has an open end.

The reason the engines disclosed in these citations have all leaned towards this design is that spark plugs, inlet and outlet ports can then be incorporated in the casing, and these then are utilised as the combustion chamber passes them as the rotor rotates. The problem inherent in this design methodology however is in sealing the rotor to the casing, particularly on a piston compression (or exhaust) stroke, where the piston will attempt to force the fresh mixture (or exhaust product) past the seals and into the gap between the rotor and the casing. The present invention overcomes this problem by providing a cylinder block, which in cooperation with the piston defines and encloses the combustion chamber. The problem of supplying fresh charges of fuel and air, and of removing exhaust products, has been overcome in the present invention then by directing these through the output shaft 13, which inturn is connected to the respective combustion chambers by internal passageways formed into the rotor.

Combustion of an air fuel mix in combustion chambers 22 drives the piston 5 and block 3 in opposing directions, this in turn rotates the pinion gear 11 that is connected to the crankshaft 7, the pinion gear 11 also engages a ring type gear 12 fixed to the casing 2, such that the rotation of the pinion gear 11 on the ring type

gear 12 rotates the cylinder block 3 relative to the casing 2 thereby providing a work output, whilst simultaneously driving the piston 5 back into a position where it can accept and then compress a fresh charge of air and fuel.

At the moment following ignition in the combustion chamber 22, engine block 3. begins moving rotationally, and the piston 5 moves away from the cylinder head 20.

The engine block 3 then is moved by the ignition of fuel, and for the duration of its combustion and for the length of the stroke that it moves upon the piston, with an optimum angle (90 degrees) of leverage to turn the cylinder block upon its axis, and it does so driven by said fuel combustion pressure exerting itself at least on one side and partly against the inside head of the top of the cylinder. The head of the cylinder is positioned in the optimum position to apply torque to rotate the block around its axis 14 and is on one side of the block axis, and it is on one side, the trailing side, of a line from the block axis whereby it is at the 90° optimum position (of thrust direction to rotate a rotational body). The engine block's rotation is aimed thereby to provide greater power than is possible by rotation conventionally by an engine crankshaft.

The engine of the invention works by the action of combustion pressure upon the rotary blockhead. Pushing of or reaction movement of the gas from the opposite side of the combustion chamber, that in this instance, is the piston head end, and that the pressure to the cylinder head end is at a maximum and is obtained in a way that enables its useful employment and to such maximum by pressure transference to the engine fixed and stationary housing or base by the said cylinder parts and gears. It is possible by this arrangement of such parts and operation that the engine's block rotation movement, the engines operation, including turning a central and output shaft, is assisted by the said pressure, (reactionary from fuel combustion) to the said piston head and piston. The piston, when it is midway down, may have the angle of the crankshaft journal at also an optimum angle of leverage of 90 degrees (to the crankshaft axis), but at that position the connecting rod to the piston above will be of an angle (sideways) and not direct, so the maximum efficiency even at that position cannot be obtained. The crankshaft when in any other position, relevant to

the downward and power stroke of the piston, has reduced below 90 degrees angle of the journal and piston connection to the crankshaft axis.

The engine 1 can operate with a two-stroke firing cycle. There is shown on opposite sides, two pairs of pistons 5 at opposite ends of cylinders 4. One pair of pistons 5 are close to the end of a compression stroke and are reaching the final top dead centre and ignition commencement region. On the opposite side of cylinder block 3 there is shown an opposite pair of pistons 5 close to the bottom end of their stroke, the end of their power stroke.

The engine 1 can also operate with a 4-stroke firing cycle, or indeed any other suitable cycles, by changing to suit ignition, fuel and air timing and supply means. The firing timing of different pistons can be sequential i.e. clockwise 1,2,3 and 4. The timing of a piston 5 affects the position of the pinion gear to the ring gear teeth mesh positioning.

The hollow shaft 13 is one example of how the engine can provide its work output, and of one preferred way air and fuel can by supplied into the engine 1, and also the removal of exhaust gas out can be provided.

The engine 1 is shown to operate in a clockwise direction of rotation and is illustrated as a horizontal installation or mounting. Engines 1 can have various drive connections such as to shaft 13, or directly to rotating block 2, to provide motive power to a vehicle or to an electrical generator or for any other type of engine application (not shown). The connection of air supply means can be via one end 15 of the shaft 13, or by a manifold (circular, not shown) on one side of the engine housing 2. Alternatively, by a manifold to the surface or side of a region of block 3 adapted to remain stationary with connections to housing 1, by provision of bearings and seals as needed. When drawing air into the combustion chamber via an inlet (filtered) can have the combustion air inlet on one side of engine block 3, and the exhaust out means on the opposite side of engine block 3. Engine block 3 can have a sealing surface around its outer and circular edge, and suitable seals provided between the cylinder and the inside of the block.

Such seals can be one on each edge of the outer and circular side of block 3 providing a lubrication oil chamber in between, and providing a sealed

chamber on each side of the engine block 3. Combustion air inlet and exhaust gas outlet can also be arranged by ports to the casing 2, in a position opposite the outer circular edge of block 3, and arranged to communicate with exhaust gas aperture and air inlet aperture of the rotating block.

Engine 1 can be of an air cooled type with means to supply air over cylinders or the engine block are provided by means such as air vents or slots through a cover on the housing 2. Alternatively, the engine can be water-cooled and custom designed radiators provided, that rotate with and which can be placed around the outer edge of engine block 3. Preferably each radiator would be dedicated to one cylinder or one self contained engine, whichever is used, preferably with a dedicated water pump, thermostat, pressure relief cap, temperature gauge, and air flow fan or slots in a cover or such like.

Alternatively, a number of dedicated radiators to a multi-cylinder engine can have common circulation with a manifold connection common to all, with inlets and outlets that close off one radiator should it fail or that engine or cylinder fail, so that the remainder are not affected.

The engine is started by a conventional means such as a starter motor, the starter motor turning a fly wheel or the rotor.

This first piston movement and second piston movement and phase can be called the power stroke of the pistons to afore cycle ignition process.

When the first piston reaches the end of this backward direction (in effect) movement the gear mechanism and crank lever causes it to accelerate and to return to the close proximity to the back of the second piston and in doing so enables it to push out spent air and fuel (exhaust gas). The gas preferably exits the cylinder via a port or valve (the is available through the cylinder at the precise and that location). In the instance that the engine's firing is twp stroke cycle, fresh air is introduced ahead of the returning piston.

The engine continues to operate with the first piston caused to move away, backward from the second piston back end and in so doing so repeats the cycle.

When the engine is of the two cycle firing stroke the air in flow and exhaust gas outflow is arranged in a system similar to normal engine two-stroke cycle, except

that the invention features improvements thereto because the piston or pistons travel rotationally and in one direction.

Where required for added power or balance more than one pair of pistons are provided, for each one circular cylinder.

Preferably the aperture in the rotor for the piston arm can be used to drain lubricating oil or excess or left over combustion gas, or as a path to allow air in or exhaust gas out (from or into the cylinder).

The cylinders overall diameter is oversize with relationship to the size of the piston used diameter so that the engine power is itself oversized (excessive power). The increase in cylinder overall diameter and relevant to piston diameter size provides the maximum and higher torque to the drive shaft from the piston from fuel burning than is otherwise possible with present known art engines.

For one example of the above oversize feature the said cylinder for an average use such as a medium size car is of approximately one metre overall outside cylinder diameter, whilst the said cylinder's inside diameter and piston diameter are approximately only 100mm. In such an engine having oversize cylinder to piston size enables a larger number of pistons to be used (because of the extra circumference and size of the cylinder

In said oversize engine feature greater inner side (central location) useable for engine parts space is provided.

This invention may have more than one cylinder per crank shaft and where required the diameter of the rotor can be reduced to reduce the engine space needed.

The firing sequence is sequential (i.e. one piston set firing at a time). The sequence can be like a clock in a circle around the cylinder, one, two and three and so on for example, or alternating from one side of the cylinder to a second, but still only one piston firing at one time.

The engine can have in fact any of the above firing cycles or any other due to and because of the piston or pistons having said independent movement.

In this embodiment the shaft extends out from the cylinder via a bearing and seals as needed, and inlet air may be ducted in via the shaft to the piston region, the shaft being deliberately oversize as needed if used as an air path. The piston may also have ports or valves to allow such air to be introduced into the combustion chamber. Such ports or valves may be controlled by the rotation of the crankshaft or and or by the piston's reciprocating movement within the cylinder. In this embodiment the cylinder itself rotates and the rotor and slot aperture in the cylinder are eliminated. The cylinder is mounted on the drive shaft via such as a centre portion to the cylinder inner side to the position of the drive shaft, and the cylinder is located within a stationary engine housing, such housing having bearing and seals to support said drive shaft.

The above alternative embodiment features the shaft to the crank inside the cylinder being connected on the outside to a drive mechanism to cause it to rotate, such as a gear, a planetary gear or gear wheel like gear, that in turn connects to a matching tooth gear, a ring or star gear, that is stationary and located on the said housing. The operation of the piston is therefore the same as above described.

The present invention in any one of the above described embodiments or examples features having a shaft from the cylinder to the region of the centre location drive shaft, this said shaft preferably has such as a gear on a first end adjacent to the drive shaft, and such gear is connected to a second gear that rotates on the drive shaft and is fixed to the drive shaft when the drive shaft is turned, thereby causing said shaft to turn, and said shaft at its second end the end inside the said cylinder then turns a crank action mechanism connected to aforesaid first pistons. Said shaft may be provided inside an embodiment using a rotor that rotates and extends into the cylinder, or the aforesaid alternative embodiment where the cylinder itself rotates and the rotor is eliminated.

In one embodiment there are counterweights arranged to reciprocate when the engine is started, one for each piston at least to balance the engine rotating cylinder block or rotor to overcome any imbalance as the piston weight moves from one point on the rotating path of the engine to a second.

In one embodiment, chains and chain sprockets are used in place of gears for the connection of the crankshaft ends (to the outside of the engine). In one embodiment the engine is made of a piston cylinder block and or housing main and rotating component, the engine then has two internally leveled out type halves that

go over and around said cylinder block and has locating space and precision fitting design for the crankshaft and con-rod and crankshaft bearings (on each side) and that join together to complete the piston sump and connection to the crank engine block (but stationary component of the engine).

In one variation of the invention the piston and crank mechanism referred to of the first and independently moving piston is replaced with a rotary action piston inside the cylinder, matched and together with a change in the design (shape) of the particular portion of the cylinder, where the rotary piston is located and used. The rotary piston is adapted to transmit the combustion of fuel energy to the rotating cylinder via a fixed engine head like portion or back of a second piston. The rotary action is by its shaft being conventional and connected via a said first gear, connected to the second gear.

In this embodiment the said rotor features being shaped suitable to provide the required and above described firing cycle, and combustion chamber one side, and is not required to itself drive the engine. Adjacent said rotor is a fixed head like forming across the cylinder that is driven by the ignition of fuel pressure, such head portion may be of a particular shape to match the requirements of a rotating rotary piston as above described, used therein.

It is considered therefore that an engine such as that described herein would prove to be of benefit to those that would benefit from an engine of increased mechanical efficiency, which is smaller and lighter, and therefore more fuel efficient.

Although the invention has been herein shown and described in what is conceived to be the most practical and preferred embodiment, it is recognised that departures can be made within the scope of the invention, which is not to be limited to the details described herein but is to be accorded the full scope of the appended claims so as to embrace any and all equivalent devices and apparatus.

CLAIMS

1. An engine having a fixed portion and at least one separate cylinder block that defines and in cooperation with a piston fully encloses at least one chamber in which the piston can reciprocate, wherein the cylinder block rotates relative to the fixed portion to provide a work output.

2. The engine in the immediately preceding claim further characterised in that the fixed portion is a casing.

3. The engine as in any one of the preceding claims further characterised in that the cylinder block is a rotor with an output shaft attached to it.

4. The engine as in any one of the preceding claims further characterised in that the fixed portion retains that rotor such that the rotor is free to rotate about an axis of rotation passing through its centre.

5. The engine as in any one of the preceding claims further characterized in that the centre of the output shaft is collinear with the axis of rotation of the cylinder block.

6. The engine as in any one of the preceding claims further characterised in that the engine is a combustion engine, the chamber a combustion chamber, and wherein the piston is oriented within the cylinder block so as to be tangentially oriented around the axis of rotation, with the head of the piston pointed in the direction of rotation.

7. The engine as in any one of the preceding claims further characterized in that inlet charges and exhaust products are supplied and removed respectively from the combustion chamber via the output shaft.

8. The engine as in any one of the preceding claims further characterised in that the piston has attached to it driving means that convert its reciprocating motion to a circular motion that assists in rotating the cylinder block relative to the fixed portion.

9. The engine as in any one of the preceding claims further characterised in that the driving means for each piston include a connecting rod, a crankshaft, and a pinion gear connected to the crankshaft which engages a ring type gear fixed to the fixed portion.

10. The engine as in any one of the preceding claims further characterised in that the piston is oriented in a plane normal to the centre of rotation of the block.

11. The engine as in any one of the preceding claims further characterised in that the piston is oriented with its head pointed in the direction that the cylinder block will rotate.

12. The engine as in any one of the preceding claims further characterized in that with respect to the direction of rotation of the block, the combustion chamber is substantially positioned on a trailing side of the centre of rotation of the block.

13. The engine as in any one of the preceding claims further characterised in that the piston is offset form the centre of rotation of the block.

14. A method of effecting a cycle of an engine including a fixed portion and at least one separate cylinder block that defines at least one chamber fully enclosed by the cylinder block, in which a piston can reciprocate, wherein the cylinder block rotates relative to the fixed portion to provide a work output, wherein as a working fluid in the chamber expands and drives the cylinder and the block in opposing directions, this in turn rotates a pinion gear that is connected to a crankshaft, the pinion gear engages a ring type gear fixed to a fixed portion, such that the rotation of the pinion gear on the ring type gear rotates the cylinder block relative to the fixed portion thereby providing a work output, whilst simultaneously driving the piston back into a position where it can accept a fresh charge.

15. The method as in the immediately preceding claim further characterised in that the fresh charge comprises fresh working fluid.

16. The method as in any one of the preceding method claims further characterised in that the fresh charge comprises working fluid and fuel.

17. The method as in any one of the preceding claims further characterised in that the working fluid is air.

18. The method as in any one of the preceding claims further characterised in that the working fluid is steam.

19. The engine as in any one of the preceding claims further characterised in that the engine is an internal combustion engine.

20. The engine substantially as described in the specification with reference to and as illustrated by the accompanying illustrations.

21. The method as described in the specification with reference to and as illustrated by the accompanying illustrations.

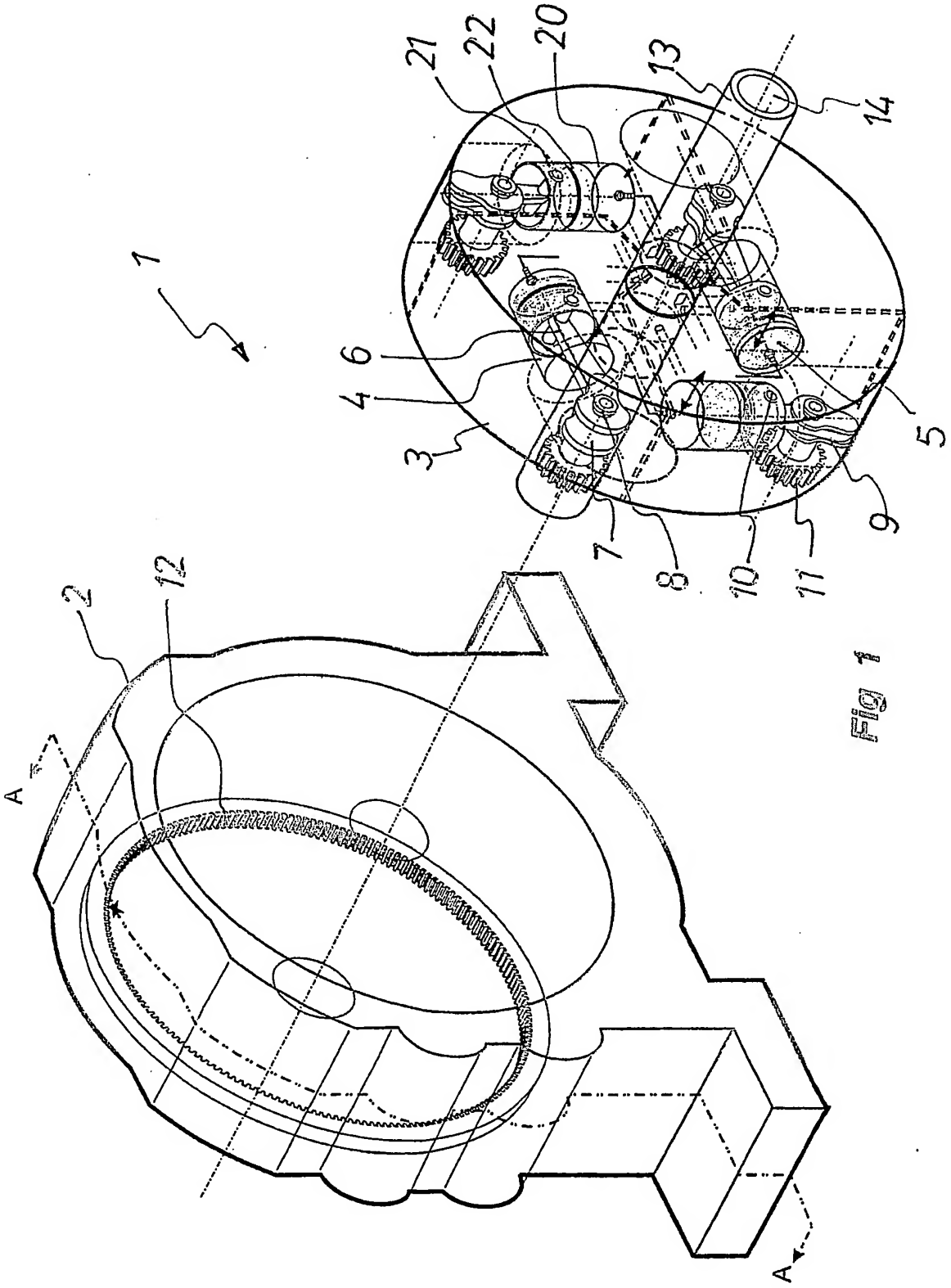

Fig 1

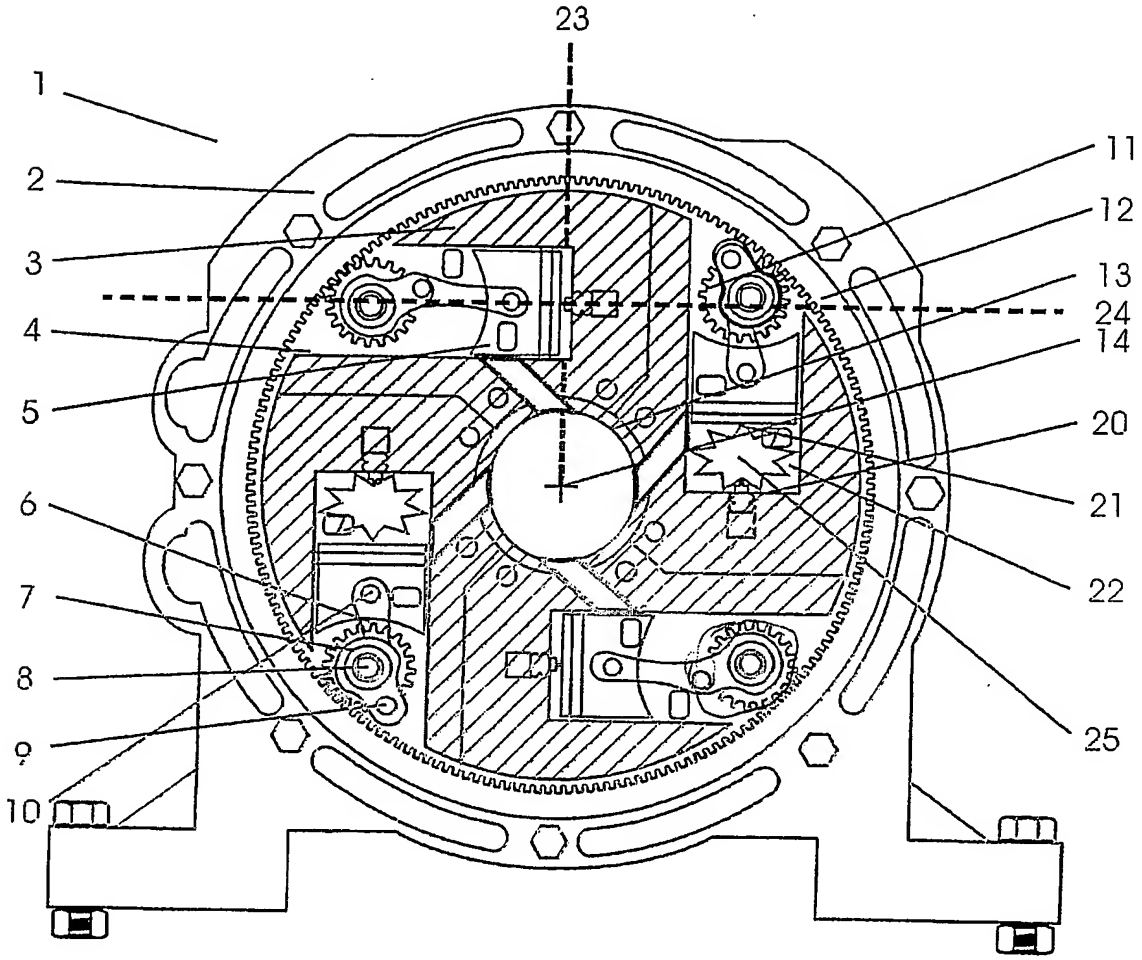

Fig 2